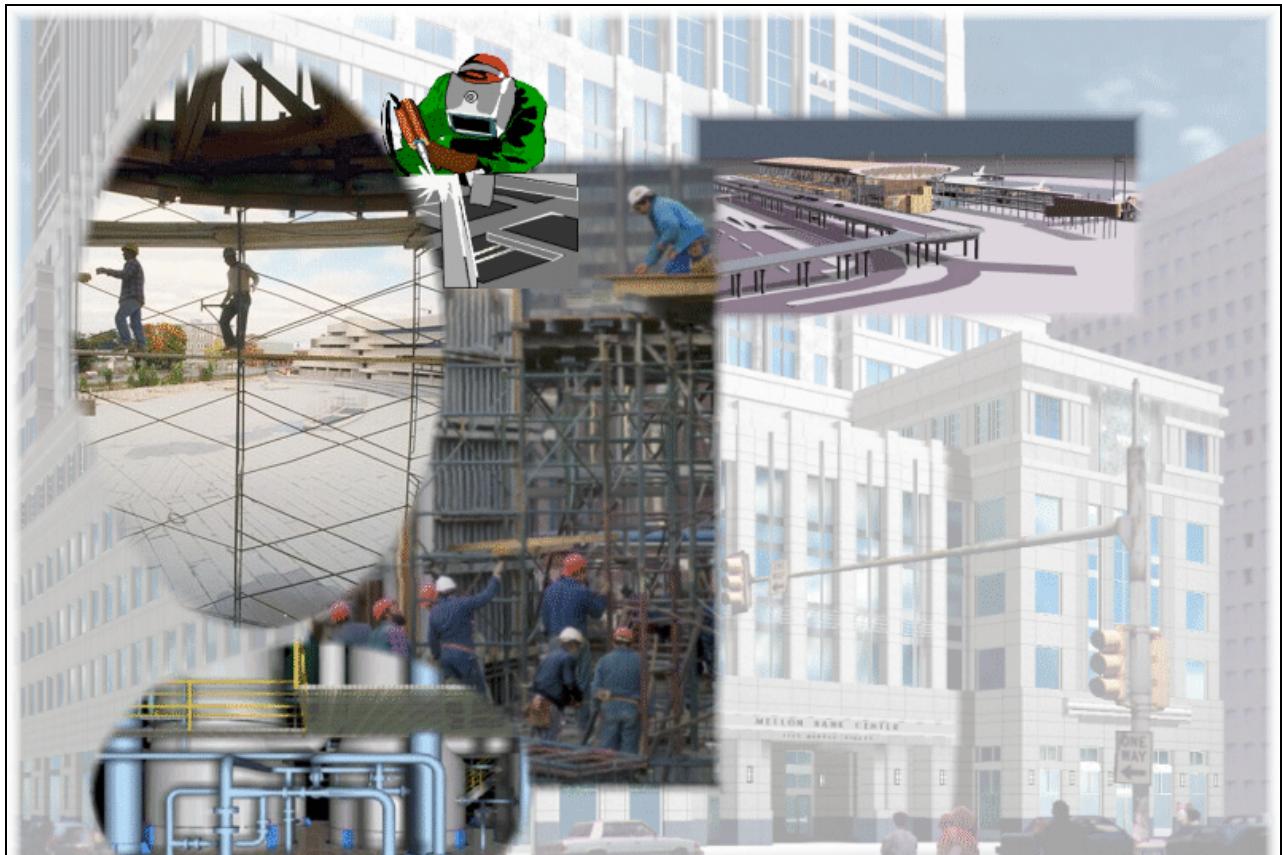


Industry Foundation Classes - Release 2.0

Specifications Volume 5

IFC Software Implementation Guide



Final Release - 15-March-99



International Alliance for Interoperability
Enabling Interoperability in the AEC/FM Industry

***Industry Foundation Classes - Release 2.0
Specifications Volume 5***

IFC Software Implementation Guide

Enabling Interoperability in the AEC/FM Industry

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Mailing address: 2960 Chain Bridge Road - Suite 143
Oakton, Virginia 22124

Email address: IAI@Interoperability.com

Web Address: www.Interoperability.com

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Document Editor

Editor	Jiri Hietanen (Primary) / Richard See (secondary)
Development committee	Specification Task Force

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1. Introduction, Scope and Assumptions

1.1. Purpose of these documents

The purpose of this document suite is to provide a detailed specification of the Industry Foundation Classes (IFC) as defined by the Industry Alliance for Interoperability (IAI). The intended audience is the IAI membership, industry domain experts, and software developers interested in implementing IFC.

1.2. IFC Release Document Suite

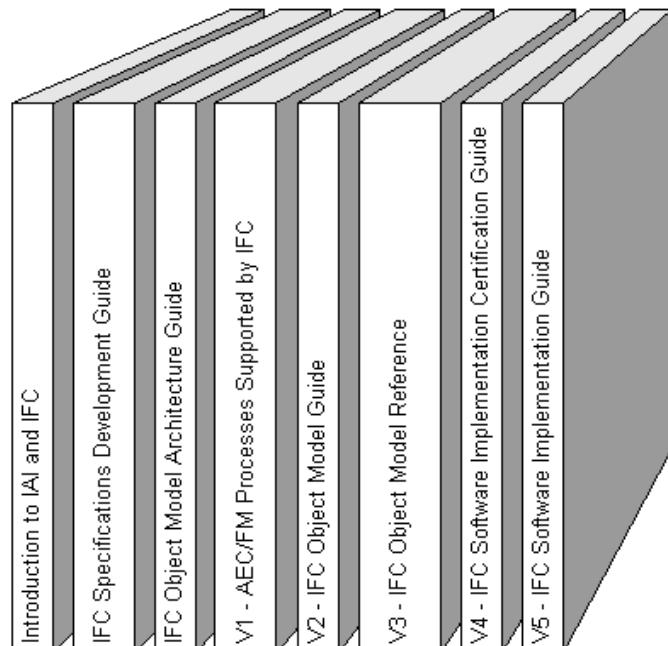
IFC will be documented for two readers. The AEC professional and the software profession serving the AEC industry. Documents in this release include:

An Introduction to IAI and IFC

The "An Introduction to IAI and IFC," as the name implies, provides AEC/FM industry professionals with an introduction to the organization, including its mission and organization. It also introduces the shared project model concept, end user benefits in using IFC compliant applications and summarizes the AEC Industry processes that are supported by this release of IFC. Finally, it provides a preview of what will be added in future releases.

IFC Specification Development Guide

The "IFC Specification Development Guide" defines the process used by the IAI in developing IFC. It also provides various references supporting parts of this process such as development of process diagrams, development of detailed requirement definitions and reading/creating EXPRESS (data model) definitions and EXPRESS-G diagrams.



IFC Object Model Architecture Guide

The "IFC Object Model Architecture Guide" defines the architecture used in the design of the IFC object model. This architecture is modular and layered which allows independent development and evolution of sub-schemata. This document is written for software developers who will develop applications supporting IFC.

Volume 1: AEC/FM Processes Supported by IFC

THIS DOCUMENT -- The "AEC/FM Processes Supported by IFC" volume documents the AEC/FM industry processes that the IFC Project Model in this release is designed to support. Therefore, this document effectively defines the scope of AEC project information included in this Release. Volumes 2 and 3 structure this information as software objects in AEC software. Note that this IFC release is limited to the information content of the foundation classes defined. Behavior for these objects, and thus the implementation of software that will support these AEC industry processes, will be defined by the implementing software vendors.

Volume 2: IFC Object Model Guide

The "IFC Object Model Guide" defines model design and use concepts for IFC object model. These key concepts include: an overview of model architecture, capturing design intent, sharing semantic relationships, model extension by application developers. It also describes some implementation strategies such as file

based model exchange, Client-Server architectures and runtime interoperability supported through standard software interfaces of the IFC model. This includes an overview and example of the physical file format for file based model exchange.

Volume 3: IFC Object Model Reference

The "*IFC Object Model Reference*" provides detailed definitions for each of the classes and data types defined in the IFC object model. This includes all of the information required by the AEC processes defined in volume 1, structured in an information model detailing object class data, relationships, standard interfaces, type definitions and geometry schema use for shape representation. Additionally, it provides a data model view defined in EXPRESS and a standard interfaces view defined in IDL. Each of these code sets will be used by application developers as input into Computer Aided Software Engineering (CASE) tools to semi-automate development of applications intended to support IFC. Finally, a on-line version of this information is provided in an HTML document set that is cross linked for easy access to information related to or supporting a particular class or data type.

Volume 4: IFC Software Implementation Certification Guide

The "*IFC Software implementation Certification Guide*" provides detailed information about conformance certifications issues and the methodology that will be used by the IAI to certify applications for multiple levels of IFC conformance. This includes an overview of the concepts for conformance assessment and certification, definition of various "Exchange Set" subsets of the IFC model for which certification can be assessed and an overview of the testing suites that will be used for certification testing.

Volume 5: IFC Software Implementation Guide

The "*IFC Software implementation Guide*" provides detailed information addressing the issues of implementing the IFC object model in software products. In this release, its content is limited to the topics of implementing property sets (previously called "Pset Guide") and the differences from the previous release (previously called "Migration Guide"). Over the next couple of IFC releases, many more topics will be addressed.

1.3. Scope

1.3.1. Scope for IFC Release 2.0

Enabling interoperability between applications by different software vendors is the ultimate goal of the IAI. This is a very ambitious goal and will be achieved through a series of incremental steps.

In general, the IAI is focused on providing three things in IFC:

1. Standard definitions for the attributes associated with entities comprising an AEC/FM project model (objects)
2. Structure and relationships between these entities from the point of view of various AEC/FM professionals
3. Standard formats/protocols for two methods of sharing this information:
 - *exchange via a standard file format*
 - *exchange via standard software interfaces*

It is important to note that the software interface specifications in this release will not include any application-specific behavior. Instead, these interfaces will be limited to get and set methods for the attribute and relationship information defined in the data model.

Release 1.5 of IFC provided the infrastructure that supports this release, plus reasonable models for architecture, some HVAC, estimating, scheduling and Facilities Management. This release will build on these foundations and extend the model in several areas.

The scope for this release of the IFC Specifications is limited to:

1. Six AEC/FM domains - Architecture, HVAC engineering, codes and standards, cost estimating, facilities management and simulation
2. Only a specific subset of the processes in these domains (defined in Volume 1 of these specifications).

These domains and processes are:

Architectural Design

- *Building 'shell' design*
- *Building 'core' design*
 - *Stair design*
 - *Public toilet design*
- *Roof design*
- *Fire Compartmentation*

HVAC Engineering

- *HVAC Duct System Design*
- *HVAC Piping System Design*
- *Pathway Design and Coordination*
- *Building Heating and Cooling Load Calculation*

Codes and Standards

- *Commercial and Residential Energy Code Compliance Checking*

Cost Estimating

- *Cost Estimating*
 - *Identify Objects*
 - *Identify Tasks Needed to Install Objects*
 - *Identify Resources Needed to Perform Tasks*
 - *Quantify*
 - *Costing and Cost Summarization*

Facilities Management

- *Property Management*
 - *Enabling the use of IFC objects in property management*
 - *Grouping IFC objects*
 - *Linking the maintenance objects to the IFC objects*
- *Occupancy Planning*
- *Design of Workstations*
- *Floor Layout of Workstations for an Open Office*

Simulation

- *Photo Accurate Visualization*

All AEC domains

- *Document references (from model to document only)*

1.3.2. Scope of this document

This document is intended to provide guidelines for software implementers. The scope is very limited in this release. It should be significantly expanded in future releases, assuming some help from members of the Software Implementation Committee.

For this release, the following information is included:

1. Introduction, Scope and Assumptions

Provides the reader with an introduction to the set of five volumes comprising this release of the IFC Specifications. This section outlines the information included in this document versus related documents. It will also define the scope for this release and assumptions about knowledge of the reader.

2. IFC Software Migration Guide

This section provides both an overview and details for all changes between IFC R1.5.1 (the previous release) and IFC R2.0 (this release). Implementers with software that supports R1.5.1 will find this section invaluable to assess the scope of work to migrate their implementation to support this IFC release.

3. Guide to Implementing Property Sets

This section provides details for implementing the dynamic parts of the IFC model. It provides details about the data types that will be instantiated for each possible property in a property set.

1.4. Assumptions and Abbreviations

This document assumes the reader is reasonably familiar with the following:

- AEC/FM market and project terminology
- Software industry terminology
- Concepts and terminology associated with object oriented software

The following abbreviations are used throughout the IFC Specifications:

- AEC/FM Architectural, Engineering, Construction and Facilities Management
- IAI Industry Alliance for Interoperability
- AP Application Protocol
- Arch Architecture
- CM Construction Management
- CORBA Common Object Request Broker Architecture
- COM Microsoft's Component Object Model
- DCE Distributed Computing Environment
- DCOM Microsoft's Distributed Component Object Model
- DSOM IBM's Distributed System Object Model
- FM Facilities Management
- FTP File Transfer Protocol
- GUID Globally Unique Identifier
- HVAC Heating, Ventilating and Air Conditioning
- HTTP Hypertext Transport Protocol
- IAI International Alliance for Interoperability
- IDL Interface Definition Language
- IFC Industry Foundation Classes
- ISO International Standards Organization
- FM Facilities Management
- MIDL Microsoft's Interface Definition Language
- ODL Microsoft's Object Description Language
- OMG Object Management Group
- ORB Object Request Broker
- OSF Open Software Foundation
- RPC Remote Procedure Call
- SOM IBM's System Object Model
- STEP Standard for the Exchange of Product Model Data
- TCP/IP Transmission Control Protocol/Internet Protocol
- TQM Total Quality Management
- URL Universal Resource Location

1.5. International Alliance for Interoperability (IAI)

The IAI is a 'not for profit' industry alliance of companies. Its membership is comprised of visionary companies representing all sectors of the AEC industry worldwide.

The IAI was first formed in September of 1995, by 12 industry leading companies who, during the previous year had worked together to develop proof of concept prototypes demonstrating the viability of interoperability between AEC software applications. This demonstration was shown publicly at the AEC Systems '95 conference in Atlanta, Georgia. This is the third release of IFC since that time. There are currently 50 organizations implementing software to support IFC, a number that is growing quite rapidly now.

As of this printing, the IAI includes 9 international chapters with hundreds of member companies in the following regions:

- Australasian countries
- French speaking region of Europe
- German speaking region of Europe
- Japan
- Korea
- Nordic countries of Europe
- North America
- Singapore
- United Kingdom

The IAI stated Vision, Mission and Values can be summarized as:

VISION

Enabling Interoperability in the A/E/C/FM Industry

MISSION

To define, promote and publish specifications for the Industry Foundation Classes (IFC) as a basis for information sharing through the project life cycle, globally, across disciplines and technical applications.

VALUES

- Not for profit industry organization
- Action oriented (Alliance v. Association)
- Consensus based decision making
- Incremental delivery (rather than prolonged study)
- Global solution
- Industry to define IFC
- IFC to be "open" (for implementation/use by all software vendors)
- Design for IFC to be extensible
- IFC will evolve over time
- Membership open to any company working in construction industry

2. IFC Software Implementation Migration Guide

2.1. Overview of Changes, by Schema

2.1.1. IfcActorResource

Select Types

No changes

Enumerations

IfcRoleEnum (New)

Class Definitions

IfcActorRole (Change)
IfcAddress (Change)
IfcOrganization (Change)
IfcPerson (Change)
IfcPersonAndOrganization (Change)

2.1.2. IfcClassificationResource

Class Definitions

IfcClassification (Change)
IfcClassificationList (Change)
IfcClassificationNotation (Change)
IfcNotationFacet (Change)

2.1.3. IfcDocumentResource

Class Definitions

IfcDocumentReference (New)
IfcDocumentType (New)

2.1.4. IfcCostResource

Enumerations

IfcCostEnum (New)

Class Definitions

IfcCost (Change)
IfcCostModifier (Change)

2.1.5. IfcDateTimeResource

Simple Types

IfcDayInMonthNumber (Change)
IfcDaylightSavingNumber (Change)
IfcHourInDay (Change)

IfcMinuteInHour (Change)
IfcMonthInYearNumber (Change)
IfcSecondInMinute (Change)
IfcYearNumber (Change)

Select Types

No changes

Enumerations

IfcAheadOrBehind (New)

Class Definitions

IfcCalendarDate (Change)
IfcCoordinatedUniversalTimeOffset (Change)
IfcDateAndTime (Change)
IfcLocalTime (Change)

2.1.6. IfcGeometryResource

Simple Types

No changes

Select Types

No changes

Enumerations

No changes

Class Definitions

IfcCurve (Change)
IfcEdge (New)
IfcOrientedEdge (New)
IfcPath (New)
IfcVertex (New)
IfcBoundedCurve (Change)
IfcConic (Change)
IfcLine (Change)

2.1.7. IfcMeasureResource

Simple Types

IfcAngularVelocityMeasure (New)
IfcDynamicViscosityMeasure (New)
IfcElectricVoltageMeasure (New)
IfcEnergyMeasure (New)
IfcFrequencyMeasure (New)
IfcHeatFluxDensityMeasure (New)
IfcIntegerCountRateMeasure (New)
IfcKinematicViscosityMeasure (New)
IfcLinearVelocityMeasure (New)
IfcMassDensityMeasure (New)
IfcMassFlowRateMeasure (New)
IfcMonetaryMeasure (New)

IfcPowerMeasure (New)
IfcPressureMeasure (New)
IfcThermalAdmittanceMeasure (New)
IfcThermalResistanceMeasure (New)
IfcThermalTransmittanceMeasure (New)
IfcVolumetricFlowrateMeasure (New)
IfcCompoundPlaneAngleMeasure (Change)
IfcTimeDurationMeasure (Deleted)

Select Types

IfcMeasureValue (Change)

Enumerations

IfcCurrencyEnum (New)
IfcDerivedUnitEnum (New)
IfcUnitEnum (New)
IfcDerivedUnitTypeEnum (Deleted)
IfcUnitTypeEnum (Deleted)

Class Definitions

IfcDerivedUnit (Change)
IfcNamedUnit (Change)
IfcSiUnit (Change)

2.1.8. IfcMaterialResource

Select Types

IfcMaterialPropertySelect (New)
IfcMaterialSelect (Change)

Class Definitions

IfcMaterial (Change)
IfcMaterialFinish (New)
IfcMaterialLayer (Change)
IfcMaterialLayerSet (Change)
IfcMaterialLayerSetUsage (Change)
IfcMaterialList (Change)

2.1.9. IfcPropertyResource

Select Types

IfcObjectReferenceSelect (New)

Class Definitions

IfcEnumeratedProperty (New)
IfcEnumeration (New)
IfcLibrary (New)
IfcLibraryReference (New)
IfcObjectReference (Change)
IfcProperty (Change)
IfcPropertyList (New)
IfcSimplePropertyWithUnit (Change)
IfcOccurrencePropertySet (Deleted)
IfcPropertySet (Change)

Ifc.PropertyTypeDef (Deleted)
 IfcRepresentationContext (Change)
 IfcShapeAspect (Change)
 IfcShapeRepresentation (Change)
 IfcSharedPropertySet (Deleted)
 IfcSimpleProperty (Change)

2.1.10. IfcRepresentationResource

Class Definitions

IfcGeometricRepresentationContext (New)
 IfcProductDefinitionShape (Change)
 IfcProductDefinitionTopology (New)
 IfcProductRepresentation (New)
 IfcRepresentation (New)
 IfcRepresentationContext (Change)
 IfcShapeAspect (Change)
 IfcShapeRepresentation (Change)
 IfcTopologyRepresentation (New)

2.1.11. IfcUtilityResource

Simple Types

IfcModifiedFlag (New)

Class Definitions

IfcApplication (New)
 IfcAuditTrail (Change)
 IfcOwnerHistory (Change)
 IfcTable (Change)
 IfcTransaction (Change)
 IfcProjectAppRegistry (Deleted)
 IfcProjectTeamRegistry (Deleted)
 IfcRegisteredApplication (Deleted)

2.1.12. IfcKernel

Select Types

No changes

Enumerations

IfcContainedOrReferencedEnum (New)
 IfcContainmentEnum (Change)
 IfcProxyEnum (Change)
 IfcResourceConsumptionEnum (New)
 IfcSequenceEnum (Change)
 IfcResourceTypeEnum (Deleted)

Class Definitions

IfcActor (New)
 IfcControl (Change)
 IfcExtensionPropertySet (New)
 IfcGroup (Change)
 IfcObject (Change)

IfcProcess (Change)
IfcProduct (Change)
IfcProject (Change)
IfcPropertyDefinition (New)
IfcPropertySet (Change)
IfcProxy (Change)
IfcRelActsUpon (New)
IfcRelAssignsProperties (New)
IfcRelAssignsTypedProperties (New)
IfcRelContains (Change)
IfcRelControls (New)
IfcRelNests (Change)
IfcRelProcessOperatesOn (Change)
IfcRelSequence (Change)
IfcResource (Change)
IfcRoot (Change)
IfcDocument (Deleted)
IfcRelUsesResource (Change)
IfcRelationship (Change)

2.1.13. IfcModelingAidExtension

Select Types

No changes

Class Definitions

IfcDesignGrid (Change)
IfcGridAxis (Change)
IfcGridLevel (Change)
IfcLightSource (New)
IfcPhotometricOutputSpace (New)

2.1.14. IfcProcessExtension

Enumerations

IfcMultiplierOrDivider (New)
IfcWorkPlanPurposeEnum (New)
IfcWorkTaskMilestoneEnum (New)
IfcWorkTaskStatusEnum (Change)

Class Definitions

IfcRelNestsProcesses (Change)
IfcRelNestsWorkScheduleElements (New)
IfcRelNestsWorkSchedules (New)
IfcRelUsesResource (Change)
IfcScheduleTimeControl (New)
IfcWorkPlan (New)
IfcWorkSchedule (Change)
IfcWorkScheduleElement (New)
IfcWorkTask (Change)

2.1.15. IfcProductExtension

Enumerations

IfcConnectionEnum (Change)

IfcElectricCurrentEnum (New)
IfcInternalOrExternalEnum (New)
IfcPhysicalOrVirtualEnum (New)
IfcBuildingStoreyTypeEnum (Deleted)
IfcBuildingTypeEnum (Deleted)
IfcOpeningTypeEnum (Deleted)
IfcSiteTypeEnum (Deleted)
IfcSpaceTypeEnum (Deleted)
IfcSystemTypeEnum (Deleted)
IfcZoneTypeEnum (Deleted)

Class Definitions

IfcBuilding (Change)
IfcBuildingStorey (Change)
IfcElectricalCharacteristics (New)
IfcManufactureInformation (New)
IfcOpeningElement (Change)
IfcRelConnectsPathElements (Change)
IfcSite (Change)
IfcSpace (Change)
IfcSpaceBoundary (Change)
IfcSystem (Change)
IfcZone (Change)

2.1.16. IfcControlExtension

Select Types

IfcMetricValueSelect (New)

Enumerations

IfcAggregatorEnum (New)
IfcApprovalStatusEnum (New)
IfcBenchmarkEnum (New)
IfcConstraintEnum (New)
IfcConstraintRelationshipEnum (New)
IfcElementConditionEnum (New)
IfcMaintenanceTypeEnum (New)
IfcMetricDataEnum (New)
IfcObjectiveEnum (New)

Class Definitions

IfcApproval (New)
IfcConstraint (New)
IfcMaintenanceRecord (New)
IfcMaintenanceType (New)
IfcMetric (New)
IfcMetricBenchmark (New)
IfcMetricValue (New)
IfcObjective (New)
IfcRelAggregatesConstraints (New)
IfcRelAssignsApprovals (New)
IfcRelControlsMaintenance (New)
IfcRelRelatesConstraints (New)

2.1.17. IfcProjectMgmtExtension

Enumerations

IfcChangeOrderStatusEnum (New)
IfcCostUseEnum (New)
IfcPurchaseOrderStatusEnum (New)
IfcWorkOrderStatusEnum (New)

Class Definitions

IfcBudget (New)
IfcChangeOrder (New)
IfcCostElement (Change)
IfcCostSchedule (Change)
IfcProjectOrder (New)
IfcPurchaseOrder (New)
IfcRelCostsObjects (New)
IfcRelNestsCostElements (Change)
IfcRelNestsCostSchedules (New)
IfcWorkOrder (New)

2.1.18. IfcSharedBldgElements

Enumerations

IfcCoveringTypeEnum (Change)
IfcDoorPanelTypeEnum (New)
IfcJointEnum (New)
IfcPermeableCoveringTypeEnum (New)
IfcSlabTypeEnum (Change)
IfcWindowPanelOperationEnum (New)
IfcWindowPanelTypeEnum (New)
IfcBeamTypeEnum (Deleted)
IfcBuiltInTypeEnum (Deleted)
IfcColumnTypeEnum (Deleted)
IfcDoorTypeEnum (Deleted)
IfcFloorTypeEnum (Deleted)
IfcWallTypeEnum (Deleted)
IfcWindowTypeEnum (Deleted)

Class Definitions

IfcCovering (Change)
IfcCurtainWall (New)
IfcDoorLining (New)
IfcDoorPanel (New)
IfcPermeableCovering (New)
IfcRelAttachesToBoundaries (New)
IfcRelJoinsElements (New)
IfcRoof (New)
IfcSlab (Change)
IfcWindowLining (New)
IfcWindowPanel (New)
IfcBeam (Change)
IfcBuiltIn (Change)
IfcColumn (Change)
IfcDoor (Change)
IfcFloor (Deleted)
IfcWall (Change)

IfcWindow (Change)

2.1.19. IfcSharedBldgServiceElements

Enumerations

IfcDiscreteElementTypeEnum (Change)
 IfcDistributionFlowElementTypeEnum (New)
 IfcDistributionPortTypeEnum (New)
 IfcElectricalApplianceTypeEnum (Change)
 IfcElectricalFixtureTypeEnum (New)
 IfcEquipmentTypeEnum (Change)
 IfcFlowDirectionEnum (New)
 IfcFlowEquipmentTypeEnum (New)
 IfcFlowFittingTypeEnum (New)
 IfcFlowSegmentTypeEnum (New)
 IfcFlowTerminalTypeEnum (New)
 IfcPlumbingFixtureTypeEnum (New)
 IfcPrimaryFittingEnum (New)
 IfcDistributionElementTypeEnum (Deleted)
 IfcFixtureTypeEnum (Deleted)

Class Definitions

IfcDiscreteElement (Change)
 IfcDistributionControlElement (New)
 IfcDistributionElement (Change)
 IfcDistributionFlowElement (New)
 IfcDistributionPortGeometry (New)
 IfcElectricalAppliance (Change)
 IfcElectricalFixture (New)
 IfcEquipment (Change)
 IfcFlowController (New)
 IfcFlowEquipment (New)
 IfcFlowFitting (New)
 IfcFlowSegment (New)
 IfcFlowTerminal (New)
 IfcLightFixture (New)
 IfcPlumbingFixture (New)
 IfcRelAttachesElements (New)
 IfcRelConnectsPorts (New)
 IfcFixture (Deleted)

2.1.20. IfcSharedSpatialElements

Enumerations

IfcLossOrGainEnum (New)
 IfcOccupantTypeEnum (New)
 IfcRequirementOrCriteriaEnum (New)
 IfcResidentEnum (New)
 IfcUseCaseSourceEnum (New)
 IfcVisitorEnum (New)

Class Definitions

IfcFireCompartment (New)
 IfcOccupancyNumber (New)
 IfcOccupant (New)
 IfcRelOccupiesSpaces (New)

IfcSpaceUseCase (New)

2.1.21. IfcArchitectureDomain

Enumerations

IfcBuiltInAccessoryTypeEnum (New)
IfcCabinetTypeEnum (New)
IfcCounterOrShelfTypeEnum (New)
IfcRailingTypeEnum (New)
IfcRampTypeEnum (New)
IfcSpaceProgramTypeEnum (Change)
IfcStairTypeEnum (New)
IfcVisualScreenTypeEnum (New)

Class Definitions

IfcBuiltInAccessory (New)
IfcCabinet (New)
IfcCounterOrShelf (New)
IfcLanding (New)
IfcRailing (New)
IfcRamp (New)
IfcRampFlight (New)
IfcRelAdjacencyReq (Change)
IfcSpaceProgram (Change)
IfcSpaceProgramGroup (Change)
IfcStair (New)
IfcStairFlight (New)
IfcVisualScreen (New)

2.1.22. IfcConstructionMgmtDomain

Class Definitions

IfcCmDocPackage (New)
IfcConstructionEquipmentResource (New)
IfcConstructionMaterialResource (New)
IfcConstructionZoneAggregationProduct (New)
IfcCrewResource (New)
IfcLaborResource (New)
IfcProductResource (New)
IfcRelAggregatesCrewResources (New)
IfcSubcontractResource (New)

2.1.23. IfcFacilitiesMgmtDomain

Enumerations

IfcFurnitureElementTypeEnum (New)
IfcFurnitureTypeEnum (Change)
IfcInventoryTypeEnum (New)
IfcOccupancyMoveTypeEnum (New)
IfcWorkstationEnum (New)

Class Definitions

IfcFurniture (Change)
IfcFurnitureModel (New)
IfcInventory (New)

IfcOccupancySchedule (New)
 IfcOccupancyScheduleElement (New)
 IfcOccupancyTask (New)
 IfcRelNestsOccupancyScheduleElements (New)
 IfcRelNestsOccupancySchedules (New)
 IfcRelWorkInteraction (New)
 IfcSystemFurnitureElement (New)
 IfcWorkstation (New)

2.1.24. IfcHvacDomain

Enumerations

IfcActuatorFailPositionEnum (New)
 IfcActuatorTypeEnum (New)
 IfcAirTerminalBoxTypeEnum (New)
 IfcControllerTypeEnum (New)
 IfcDamperSizingMethodEnum (New)
 IfcDamperTypeEnum (New)
 IfcSensorTypeEnum (New)
 IfcValveEnum (New)

Class Definitions

IfcActuator (New)
 IfcAirTerminalBox (New)
 IfcController (New)
 IfcDamper (New)
 IfcSensor (New)
 IfcValve (New)

2.2. Details about changed objects

2.2.1. Class IfcActorRole

Schema

Moved from IfcPropertyResource_R151 to IfcActorResource in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Role	IfcRoleEnum	New attribute in R2.0 Final
Description	OPTIONAL STRING	No Change
Name	IfcRoleTypeEnum	Deleted

2.2.2. Class IfcAddress

Schema

Moved from IfcPropertyResource_R151 to IfcActorResource in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
InternalLocation	OPTIONAL STRING	No Change
AddressLines	LIST [0:?] OF STRING	No Change
Town	OPTIONAL STRING	No Change
Region	OPTIONAL STRING	No Change

PostalCode	OPTIONAL STRING	<i>No Change</i>
Country	OPTIONAL STRING	<i>No Change</i>
FaxNumbers	LIST [0:?] OF STRING	<i>No Change</i>
TelephoneNumber	LIST [0:?] OF STRING	<i>No Change</i>
ElectronicMailAddresses	LIST [0:?] OF STRING	<i>No Change</i>
TelexNumber	OPTIONAL STRING	<i>No Change</i>
WWWHomePageURL	OPTIONAL STRING	New attribute in R2.0 Final
Description	OPTIONAL STRING	<i>No Change</i>
PostalBox	OPTIONAL STRING	New attribute in R2.0 Final
OfPerson	SET [0:?] OF IfcPerson	<i>No Change</i>
OfOrganization	SET [0:?] OF IfcOrganization	<i>No Change</i>
WWWHomePage	STRING	Deleted

2.2.3. Class IfcOrganization

Schema

Moved from IfcPropertyResource_R151 to IfcActorResource in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Name	STRING	<i>No Change</i>
Addresses	LIST [0:?] OF IfcAddress	New attribute in R2.0 Final
Roles	LIST [0:?] OF IfcActorRole	<i>No Change</i>
Description	OPTIONAL STRING	<i>No Change</i>
Adresses	LIST [0:?] OF IfcAddress	Deleted

2.2.4. Class IfcPerson

Schema

Moved from IfcPropertyResource_R151 to IfcActorResource in R2.0 Final

Attributes and Relationships

No Changes

2.2.5. Class IfcPersonAndOrganization

Schema

Moved from IfcPropertyResource_R151 to IfcActorResource in R2.0 Final

Attributes and Relationships

No Changes

2.2.6. Class IfcClassification

Schema

Moved from IfcPropertyResource_R151 to IfcClassificationResource in R2.0 Final

Attributes and Relationships

No Changes

2.2.7. Class IfcClassificationList

Schema

Moved from IfcPropertyResource_R151 to IfcClassificationResource in R2.0 Final

Attributes and Relationships

No Changes

2.2.8. Class IfcClassificationNotation

Schema

Moved from IfcPropertyResource_R151 to IfcClassificationResource in R2.0 Final

Attributes and Relationships

No Changes

2.2.9. Class IfcNotationFacet

Schema

Moved from IfcPropertyResource_R151 to IfcClassificationResource in R2.0 Final

Attributes and Relationships

No Changes

2.2.10. Class IfcCost

Schema

Moved from IfcPropertyResource_R151 to IfcCostResource in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
CostType	IfcCostEnum	IfcCostTypeEnum
BaseCostValue	OPTIONAL IfcMonetaryMeasure	OPTIONAL REAL
FinalCostValue	OPTIONAL IfcMonetaryMeasure	OPTIONAL REAL
Currency	IfcCurrencyEnum	IfcCurrencyTypeEnum
ModifierBasis	OPTIONAL IfcModifierBasisEnum	<i>No Change</i>
ModifierValues	LIST [0:?] OF IfcCostModifier	New attribute in R2.0 Final
UnitCostBasis	IfcMeasureWithUnit	<i>No Change</i>
CostDate	OPTIONAL IfcDateTimeSelect	<i>No Change</i>
CostComponents	LIST [0:?] OF IfcCost	<i>No Change</i>
ComponentOf	SET [0:?] OF IfcCost	New attribute in R2.0 Final
CostModifiers	LIST [0:?] OF IfcCostModifier	Deleted

2.2.11. Class IfcCostModifier

Schema

Moved from IfcPropertyResource_R151 to IfcCostResource in R2.0 Final

Attributes and Relationships

No Changes

2.2.12. Type IfcDayInMonthNumber

Schema

Moved from IfcPropertyResource_R151 to IfcDateTimeResource in R2.0 Final

Type

R2.0 Final	Change from Release 1.5.1
INTEGER	No Change

2.2.13. Type IfcDaylightSavingNumber

Schema

Moved from IfcPropertyResource_R151 to IfcDateTimeResource in R2.0 Final

Type

R2.0 Final	Change from Release 1.5.1
INTEGER	No Change

2.2.14. Type IfcHourInDay

Schema

Moved from IfcPropertyResource_R151 to IfcDateTimeResource in R2.0 Final

Type

R2.0 Final	Change from Release 1.5.1
INTEGER	No Change

2.2.15. Type IfcMinuteInHour

Schema

Moved from IfcPropertyResource_R151 to IfcDateTimeResource in R2.0 Final

Type

R2.0 Final	Change from Release 1.5.1
INTEGER	No Change

2.2.16. Type IfcMonthInYearNumber

Schema

Moved from IfcPropertyResource_R151 to IfcDateTimeResource in R2.0 Final

Type

R2.0 Final	Change from Release 1.5.1
INTEGER	No Change

2.2.17. Type IfcSecondInMinute

Schema

Moved from IfcPropertyResource_R151 to IfcDateTimeResource in R2.0 Final

Type

R2.0 Final	Change from Release 1.5.1
REAL	No Change

2.2.18. Type IfcYearNumber

Schema

Moved from IfcPropertyResource_R151 to IfcDateTimeResource in R2.0 Final

Type

R2.0 Final	Change from Release 1.5.1
INTEGER	<i>No Change</i>

2.2.19. Class IfcCalendarDate

Schema

Moved from IfcPropertyResource_R151 to IfcDateTimeResource in R2.0 Final

Attributes and Relationships

No Changes

2.2.20. Class IfcCoordinatedUniversalTimeOffset

Schema

Moved from IfcPropertyResource_R151 to IfcDateTimeResource in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
HourOffset	IfcHourInDay	<i>No Change</i>
MinuteOffset	OPTIONAL IfcMinutelnHour	<i>No Change</i>
Sense	IfcAheadOrBehind	New attribute in R2.0 Final
Ahead	BOOLEAN	Deleted

2.2.21. Class IfcDateAndTime

Schema

Moved from IfcPropertyResource_R151 to IfcDateTimeResource in R2.0 Final

Attributes and Relationships

No Changes

2.2.22. Class IfcLocalTime

Schema

Moved from IfcPropertyResource_R151 to IfcDateTimeResource in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
HourComponent	IfcHourInDay	<i>No Change</i>
MinuteComponent	OPTIONAL IfcMinutelnHour	<i>No Change</i>
SecondComponent	OPTIONAL IfcSecondlnMinute	<i>No Change</i>
Zone	OPTIONAL IfcCoordinatedUniversalTimeOffset	<i>IfcCoordinatedUniversalTimeOffset</i>
DaylightSavingOffset	OPTIONAL IfcDaylightSavingNumber	<i>No Change</i>

2.2.23. Class IfcBoundedCurve

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Dim	IfcDimensionCount	Deleted

2.2.24. Class IfcConic

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Position	IfcAxis2Placement	No Change
Dim	IfcDimensionCount	Deleted

2.2.25. Class IfcCurve

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Dim	IfcDimensionCount	New attribute in R2.0 Final

2.2.26. Class IfcLine

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Pnt	IfcCartesianPoint	No Change
Dir	IfcVector	No Change
Dim	IfcDimensionCount	Deleted

2.2.27. Type IfcCompoundPlaneAngleMeasure

Type

R2.0 Final	Change from Release 1.5.1
LIST [3:3] OF INTEGER	No Change

2.2.28. Type IfcMeasureValue

Select

R2.0 Final	Change from Release 1.5.1
IfcAmountOfSubstanceMeasure	No Change
IfcAngularVelocityMeasure	New in R2.0 Final
IfcAreaMeasure	No Change
IfcBoolean	No Change
IfcCompoundPlaneAngleMeasure	No Change
IfcContextDependentMeasure	No Change
IfcCountMeasure	No Change
IfcDescriptiveMeasure	No Change
IfcDynamicViscosityMeasure	New in R2.0 Final
IfcElectricCurrentMeasure	No Change
IfcElectricVoltageMeasure	New in R2.0 Final
IfcEnergyMeasure	New in R2.0 Final
IfcHeatFluxDensityMeasure	New in R2.0 Final

R2.0 Final	Change from Release 1.5.1
IfcInteger	No Change
IfcIntegerCountRateMeasure	New in R2.0 Final
IfcKinematicViscosityMeasure	New in R2.0 Final
IfcLengthMeasure	No Change
IfcLinearVelocityMeasure	New in R2.0 Final
IfcLuminousIntensityMeasure	No Change
IfcMassDensityMeasure	New in R2.0 Final
IfcMassFlowRateMeasure	New in R2.0 Final
IfcMassMeasure	No Change
IfcMonetaryMeasure	New in R2.0 Final
IfcNumericMeasure	No Change
IfcParameterValue	No Change
IfcPlaneAngleMeasure	No Change
IfcPositiveLengthMeasure	No Change
IfcPositivePlaneAngleMeasure	No Change
IfcPositiveRatioMeasure	No Change
IfcPowerMeasure	New in R2.0 Final
IfcPressureMeasure	New in R2.0 Final
IfcRatioMeasure	No Change
IfcReal	No Change
IfcFrequencyMeasure	New in R2.0 Final
IfcSolidAngleMeasure	No Change
IfcString	No Change
IfcThermalAdmittanceMeasure	New in R2.0 Final
IfcThermalResistanceMeasure	New in R2.0 Final
IfcThermalTransmittanceMeasure	New in R2.0 Final
IfcThermodynamicTemperatureMeasure	No Change
IfcTimeMeasure	No Change
IfcTimeStamp	No Change
IfcVolumeMeasure	No Change
IfcVolumetricFlowrateMeasure	New in R2.0 Final
IfcTimeDurationMeasure	Deleted

2.2.29. Class IfcDerivedUnit

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Elements	SET [1:?] OF IfcDerivedUnitElement	No Change
UnitType	IfcDerivedUnitEnum	IfcDerivedUnitTypeEnum
Dimensions	IfcDimensionalExponents	No Change

2.2.30. Class IfcNamedUnit

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Dimensions	IfcDimensionalExponents	No Change
UnitType	IfcUnitEnum	IfcUnitTypeEnum

2.2.31. Class IfcSiUnit

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Prefix	OPTIONAL IfcSiPrefix	No Change
Name	IfcSiUnitName	No Change
SELF\IfcNamedUnit.Dimensions	IfcDimensionalExponents	New attribute in R2.0 Final
Dimensions	IfcDimensionalExponents	Deleted

2.2.32. Type IfcMaterialSelect

Schema

Moved from IfcPropertyResource_R151 to IfcMaterialResource in R2.0 Final

Select

	R2.0 Final	Change from Release 1.5.1
IfcMaterial		No Change
IfcMaterialList		New in R2.0 Final
IfcMaterialLayer		New in R2.0 Final
IfcMaterialLayerSet		No Change
IfcMaterialComposite		Deleted

2.2.33. Class IfcMaterial

Schema

Moved from IfcPropertyResource_R151 to IfcMaterialResource in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
MaterialName	STRING	No Change
MaterialClassification	OPTIONAL IfcClassificationList	No Change
MaterialFinishes	SET [0:?] OF IfcMaterialFinish	New attribute in R2.0 Final
Properties	SET [0:?] OF IfcMaterialPropertySelect	New attribute in R2.0 Final
RegisteredBy	IfcProjectMaterialRegistry	Deleted

2.2.34. Class IfcMaterialLayer

Schema

Moved from IfcPropertyResource_R151 to IfcMaterialResource in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Material	IfcMaterial	No Change
OffsetFromMLSBase	IfcLengthMeasure	IfcPositiveLengthMeasure
LayerThickness	IfcPositiveLengthMeasure	No Change
ToMaterialLayerSet	IfcMaterialLayerSet	New attribute in R2.0 Final
DefaultPriority	INTEGER	Deleted

2.2.35. Class IfcMaterialLayerSet

Schema

Moved from IfcPropertyResource_R151 to IfcMaterialResource in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
HasMaterialLayers	LIST [1:?] OF IfcMaterialLayer	No Change
IsVentilated	BOOLEAN	New attribute in R2.0 Final
LayerSetName	STRING	Deleted

2.2.36. Class IfcMaterialLayerSetUsage

Schema

Moved from IfcPropertyResource_R151 to IfcMaterialResource in R2.0 Final

Attributes and Relationships

No Changes

2.2.37. Class IfcMaterialList

Name

Name changed from IfcMaterialComposite to IfcMaterialList in R2.0 Final

Schema

Moved from IfcPropertyResource_R151 to IfcMaterialResource in R2.0 Final

Attributes and Relationships

No Changes

2.2.38. Class IfcObjectReference

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
ObjectReference	IfcObjectReferenceSelect	IfcGloballyUniqueId
Descriptor	STRING	Deleted

2.2.39. Class IfcProperty

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Name	STRING	New attribute in R2.0 Final
PartOfPropertyList	SET [0:1] OF IfcPropertyList	New attribute in R2.0 Final
PartOfPropertySet	SET [0:1] OF IfcPropertySet	Deleted

2.2.40. Class IfcPropertySet

Schema

Moved from IfcPropertyResource to IfcKernel in R2.0 Final

Superclass

Superclass changed from IfcProperty to IfcPropertyDefinition

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Name	STRING	New attribute in R2.0 Final
HasProperties	LIST [1:?] OF IfcProperty	No Change
ProjectId	IfcGloballyUniqueId	Deleted
Descriptor	STRING	Deleted

2.2.41. Class IfcRepresentationContext

Schema

Moved from IfcPropertyResource to IfcRepresentationResource in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
GlobalId	IfcGloballyUniqueId	New attribute in R2.0 Final
ContextIdentifier	STRING	New attribute in R2.0 Final
ContextType	STRING	New attribute in R2.0 Final
RepresentationsInContext	SET [1:?] OF IfcRepresentation	SET [1:?] OF IfcShapeRepresentation
ProjectId	IfcGloballyUniqueId	Deleted
DetailType	IfcRepDetailTypeEnum	Deleted
ViewType	IfcRepViewTypeEnum	Deleted
Precision	INTEGER	Deleted

2.2.42. Class IfcShapeAspect

Schema

Moved from IfcPropertyResource to IfcRepresentationResource in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
GlobalId	IfcGloballyUniqueId	New attribute in R2.0 Final
ShapeRepresentations	LIST [1:?] OF IfcShapeRepresentation	No Change
Name	OPTIONAL STRING	New attribute in R2.0 Final
Description	OPTIONAL STRING	New attribute in R2.0 Final
ProductDefinitional	LOGICAL	New attribute in R2.0 Final
PartOfProductDefinitionShape	IfcProductDefinitionShape	New attribute in R2.0 Final
ProjectId	IfcGloballyUniqueId	Deleted
Descriptor	STRING	Deleted
PartOfProductShape	IfcProductShape	Deleted

2.2.43. Class IfcShapeRepresentation

Schema

Moved from IfcPropertyResource to IfcRepresentationResource in R2.0 Final

Superclass

Superclass changed from *Nothing* to IfcRepresentation

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Items	SET [1:?] OF IfcGeometricRepresentationItem	No Change
OfProductDefinitionShape	SET [0:1] OF IfcProductDefinitionShape	New attribute in R2.0 Final

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
OfShapeAspect	SET [0:1] OF IfcShapeAspect	No Change
ContextOfItems	IfcRepresentationContext	Deleted
RepresentationType	IfcShapeRepTypeEnum	Deleted
UsageDescriptor	STRING	Deleted
OfProductShape	SET [0:1] OF IfcProductShape	Deleted

2.2.44. Class IfcSimpleProperty

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
ValueComponent	IfcMeasureValue	No Change
Descriptor	STRING	Deleted

2.2.45. Class IfcSimplePropertyWithUnit

Name

Name changed from IfcPropertyWithUnit to IfcSimplePropertyWithUnit in R2.0 Final

Superclass

Superclass changed from IfcSimpleProperty to IfcProperty

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
ValueWithUnit	IfcMeasureWithUnit	New attribute in R2.0 Final
UnitComponent	IfcUnit	Deleted

2.2.46. Class IfcProductDefinitionShape

Name

Name changed from IfcProductShape to IfcProductDefinitionShape in R2.0 Final

Schema

Moved from IfcPropertyResource to IfcRepresentationResource in R2.0 Final

Superclass

Superclass changed from IfcProperty to IfcProductRepresentation

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
ShapeRepresentations	LIST [1:?] OF IfcShapeRepresentation	No Change
HasShapeAspects	SET [0:?] OF IfcShapeAspect	No Change
ProjectId	IfcGloballyUniqueId	Deleted
Descriptor	STRING	Deleted

2.2.47. Class IfcRepresentationContext

Schema

Moved from IfcPropertyResource to IfcRepresentationResource in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
GlobalId	IfcGloballyUniqueId	New attribute in R2.0 Final

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
ContextIdentifier	STRING	New attribute in R2.0 Final
ContextType	STRING	New attribute in R2.0 Final
RepresentationsInContext	SET [1:?] OF IfcRepresentation	SET [1:?] OF IfcShapeRepresentation
ProjectId	IfcGloballyUniqueId	Deleted
DetailType	IfcRepDetailTypeEnum	Deleted
ViewType	IfcRepViewTypeEnum	Deleted
Precision	INTEGER	Deleted

2.2.48. Class IfcShapeAspect

Schema

Moved from IfcPropertyResource to IfcRepresentationResource in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
GlobalId	IfcGloballyUniqueId	New attribute in R2.0 Final
ShapeRepresentations	LIST [1:?] OF IfcShapeRepresentation	No Change
Name	OPTIONAL STRING	New attribute in R2.0 Final
Description	OPTIONAL STRING	New attribute in R2.0 Final
ProductDefinitional	LOGICAL	New attribute in R2.0 Final
PartOfProductDefinitionShape	IfcProductDefinitionShape	New attribute in R2.0 Final
ProjectId	IfcGloballyUniqueId	Deleted
Descriptor	STRING	Deleted
PartOfProductShape	IfcProductShape	Deleted

2.2.49. Class IfcShapeRepresentation

Schema

Moved from IfcPropertyResource to IfcRepresentationResource in R2.0 Final

Superclass

Superclass changed from *Nothing* to IfcRepresentation

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Items	SET [1:?] OF IfcGeometricRepresentationItem	No Change
OfProductDefinitionShape	SET [0:1] OF IfcProductDefinitionShape	New attribute in R2.0 Final
OfShapeAspect	SET [0:1] OF IfcShapeAspect	No Change
ContextOfItems	IfcRepresentationContext	Deleted
RepresentationType	IfcShapeRepTypeEnum	Deleted
UsageDescriptor	STRING	Deleted
OfProductShape	SET [0:1] OF IfcProductShape	Deleted

2.2.50. Class IfcAuditTrail

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
CreationDate	IfcTimeStamp	No Change
DeletionDate	OPTIONAL IfcTimeStamp	No Change
CreatingUser	IfcPersonAndOrganization	INTEGER

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
DeletingUser	OPTIONAL IfcPersonAndOrganization	OPTIONAL INTEGER
CreatingApplication	IfcApplication	INTEGER
DeletingApplication	OPTIONAL IfcApplication	OPTIONAL INTEGER
Transactions	LIST [0:?] OF IfcTransaction	LIST [0:AuditTrailLength] OF IfcTransaction
ToOwnerHistory	IfcOwnerHistory	No Change
AuditTrailLength	INTEGER	Deleted

2.2.51. Class IfcOwnerHistory

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
OwningUser	IfcPersonAndOrganization	New attribute in R2.0 Final
OwningApplication	IfcApplication	INTEGER
ModifiedFlag	IfcModifiedFlag	New attribute in R2.0 Final
ApplicationId	OPTIONAL STRING	No Change
OwnerDescriptor	OPTIONAL STRING	No Change
AuditTrail	OPTIONAL IfcAuditTrail	No Change
OwningActor	INTEGER	Deleted

2.2.52. Class IfcTable

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
GlobalId	IfcGloballyUniqueId	New attribute in R2.0 Final
Name	STRING	No Change
Rows	LIST [1:?] OF IfcTableRow	No Change
NumberOfCellsInRow	INTEGER	No Change
NumberOfHeadings	INTEGER	No Change
NumberOfDataRows	INTEGER	No Change
ProjectId	IfcGloballyUniqueId	Deleted

2.2.53. Class IfcTransaction

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
TransactionDate	IfcTimeStamp	No Change
TransactingUser	IfcPersonAndOrganization	INTEGER
TransactingApplication	IfcApplication	INTEGER
ToAuditTrail	IfcAuditTrail	No Change

2.2.54. Type IfcContainmentEnum

Name

Name changed from IfcContainmentTypeEnum to IfcContainmentEnum in R2.0 Final

Enumeration

R2.0 Final	Change from Release 1.5.1
ProjectContainer	No Change
SiteContainer	No Change

R2.0 Final	Change from Release 1.5.1
BuildingContainer	No Change
BuildingStoreyContainer	No Change
SpaceContainer	No Change
ZoneContainer	New in R2.0 Final
NotDefined	New in R2.0 Final

2.2.55. Type IfcProxyEnum

Name

Name changed from IfcProxyTypeEnum to IfcProxyEnum in R2.0 Final

Enumeration

R2.0 Final	Change from Release 1.5.1
Product	No Change
Process	No Change
Control	No Change
Document	No Change
Resource	No Change
NotDefined	New in R2.0 Final

2.2.56. Type IfcSequenceEnum

Name

Name changed from IfcSequenceTypeEnum to IfcSequenceEnum in R2.0 Final

Enumeration

R2.0 Final	Change from Release 1.5.1
Start_Start	No Change
Start_Finish	No Change
Finish_Start	No Change
Finish_Finish	No Change
NotDefined	New in R2.0 Final

2.2.57. Class IfcControl

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Classification	OPTIONAL IfcClassificationList	New attribute in R2.0 Final
Controls	SET [0:?] OF IfcRelControls	New attribute in R2.0 Final

2.2.58. Class IfcGroup

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
GroupPurpose	OPTIONAL STRING	No Change
IsGroupedBy	IfcRelGroups	New attribute in R2.0 Final
GroupedBy	IfcRelGroups	Deleted

2.2.59. Class IfcObject

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
UserDefinedType	OPTIONAL STRING	New attribute in R2.0 Final
DocumentReferences	SET [0:?] OF IfcDocumentReference	New attribute in R2.0 Final
PartOfGroups	SET [0:?] OF IfcRelGroups	No Change
Nests	SET [0:1] OF IfcRelNests	No Change
IsNestedBy	SET [0:?] OF IfcRelNests	No Change
Contains	SET [0:2] OF IfcRelContains	No Change
IsContainedBy	SET [0:?] OF IfcRelContains	No Change
OperatedInProcesses	SET [0:?] OF IfcRelProcessOperatesOn	New attribute in R2.0 Final
IsDefinedBy	SET [0:?] OF IfcRelAssignsProperties	New attribute in R2.0 Final
IsActedUpon	SET [0:?] OF IfcRelActsUpon	New attribute in R2.0 Final
IsControlledBy	SET [0:?] OF IfcRelControls	New attribute in R2.0 Final
OwnerHistory	IfcOwnerHistory	Deleted
TypeDefinitions	LIST [0:?] OF IfcPropertyTypeDef	Deleted
OccurrenceProperties	LIST [0:?] OF IfcOccurrencePropertySet	Deleted
ExtendedProperties	LIST [0:?] OF IfcPropertySet	Deleted

2.2.60. Class IfcProcess

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Productivity	OPTIONAL IfcMeasureWithUnit	New attribute in R2.0 Final
Classification	OPTIONAL IfcClassificationList	No Change
IsSuccessorFrom	SET [0:?] OF IfcRelSequence	No Change
IsPredecessorTo	SET [0:?] OF IfcRelSequence	No Change
OperatesOn	SET [0:?] OF IfcRelProcessOperatesOn	New attribute in R2.0 Final
PerformedBy	SET [0:?] OF IfcActorSelect	Deleted
ProcessesProducts	SET [0:2] OF IfcRelProcessesProducts	Deleted
UsesResources	SET [0:?] OF IfcRelUsesResource	Deleted

2.2.61. Class IfcProduct

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
LocalPlacement	IfcLocalPlacement	No Change
Representations	SET [0:2] OF IfcProductRepresentation	New attribute in R2.0 Final
Classification	OPTIONAL IfcClassificationList	No Change
ProductShape	IfcProductShape	Deleted
ProductCost	IfcCost	Deleted
ProcessedInProcesses	SET [0:?] OF IfcRelProcessesProducts	Deleted

2.2.62. Class IfcProject

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
ReferenceName	OPTIONAL STRING	New attribute in R2.0 Final
Name	OPTIONAL STRING	New attribute in R2.0 Final

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Phase	OPTIONAL STRING	New attribute in R2.0 Final
UnitsInContext	IfcUnitAssignment	No Change
Classification	OPTIONAL IfcClassificationList	No Change
AbsolutePlacement	IfcAxis2Placement	No Change
ProjectTeam	IfcProjectTeamRegistry	Deleted
ProjectApps	IfcProjectAppRegistry	Deleted
ProjectMaterials	IfcProjectMaterialRegistry	Deleted

2.2.63. Class IfcPropertySet

Schema

Moved from IfcPropertyResource to IfcKernel in R2.0 Final

Superclass

Superclass changed from IfcProperty to IfcPropertyDefinition

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Name	STRING	New attribute in R2.0 Final
HasProperties	LIST [1:?] OF IfcProperty	No Change
ProjectId	IfcGloballyUniqueId	Deleted
Descriptor	STRING	Deleted

2.2.64. Class IfcProxy

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
ProxyType	IfcProxyEnum	IfcProxyTypeEnum
LocalPlacement	OPTIONAL IfcLocalPlacement	No Change
Representations	SET [0:2] OF IfcProductRepresentation	New attribute in R2.0 Final
ProductShape	IfcProductShape	Deleted

2.2.65. Class IfcRelContains

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
RelatingObject	IfcObject	No Change
RelatedObjects	LIST [1:?] OF UNIQUE IfcObject	No Change
RelationshipType	IfcContainmentEnum	IfcContainmentTypeEnum
ContainedOrReferenced	IfcContainedOrReferencedEnum	BOOLEAN

2.2.66. Class IfcRelNests

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
RelatingObject	IfcObject	No Change
RelatedObjects	LIST [1:?] OF UNIQUE IfcObject	No Change
NestingPurpose	OPTIONAL STRING	New attribute in R2.0 Final

2.2.67. Class IfcRelProcessOperatesOn

Name

Name changed from IfcRelProcessesProducts to IfcRelProcessOperatesOn in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
RelatingProcess	IfcProcess	No Change
RelatedObject	IfcObject	New attribute in R2.0 Final
OperationType	STRING	New attribute in R2.0 Final
OperationQuantity	IfcMeasureWithUnit	New attribute in R2.0 Final
RelatedProducts	LIST [1:?] OF IfcProduct	Deleted
InOrOut	LOGICAL	Deleted

2.2.68. Class IfcRelSequence

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
RelatingProcess	IfcProcess	No Change
RelatedProcess	IfcProcess	No Change
TimeLag	IfcTimeMeasure	IfcTimeDurationMeasure
SequenceType	IfcSequenceEnum	IfcSequenceTypeEnum

2.2.69. Class IfcRelUsesResource

Schema

Moved from IfcKernel to IfcProcessExtension in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
RelatingProcess	IfcProcess	No Change
RelatedResource	IfcResource	No Change
Duration	OPTIONAL IfcTimeMeasure	New attribute in R2.0 Final
Quantity	OPTIONAL IfcMeasureWithUnit	New attribute in R2.0 Final
ProductivityConversionRate	OPTIONAL IfcMeasureWithUnit	New attribute in R2.0 Final
ConverterMultiplierOrDivider	OPTIONAL IfcMultiplierOrDivider	New attribute in R2.0 Final
ResourceUseCosts	SET [0:?] OF IfcCostElement	New attribute in R2.0 Final
WasteFactor	OPTIONAL REAL	New attribute in R2.0 Final
ResourceDuration	IfcTimeDurationMeasure	Deleted
ResourceQuantity	REAL	Deleted
ResourceUseCost	IfcCost	Deleted

2.2.70. Class IfcRelationship

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
RelatedIsDependent	BOOLEAN	No Change
RelatingIsDependent	BOOLEAN	No Change
OwnerHistory	IfcOwnerHistory	Deleted
ExtendedProperties	LIST [0:?] OF IfcPropertySet	Deleted

2.2.71. Class IfcResource

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Description	OPTIONAL STRING	New attribute in R2.0 Final
TypeReference	STRING	New attribute in R2.0 Final
TypeName	STRING	New attribute in R2.0 Final
Classification	OPTIONAL IfcClassificationList	New attribute in R2.0 Final
ResourceConsumption	OPTIONAL IfcResourceConsumptionEnum	New attribute in R2.0 Final
BaseUnit	OPTIONAL IfcMeasureWithUnit	New attribute in R2.0 Final
GenericType	IfcResourceTypeEnum	Deleted
Descriptor	STRING	Deleted
UnitCost	IfcCost	Deleted
UsedInProcesses	SET [0:?] OF IfcRelUsesResource	Deleted

2.2.72. Class IfcRoot

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
GlobalId	IfcGloballyUniqueId	New attribute in R2.0 Final
OwnerHistory	IfcOwnerHistory	New attribute in R2.0 Final
Label	OPTIONAL STRING	New attribute in R2.0 Final
ProjectId	IfcGloballyUniqueId	Deleted

2.2.73. Class IfcDesignGrid

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
GridPurpose	OPTIONAL STRING	STRING
LocalPlacement	IfcLocalPlacement	No Change
HasGridLevels	SET [1:?] OF IfcGridLevel	No Change

2.2.74. Class IfcGridAxis

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
PartOfGridLevel	IfcGridLevel	No Change
AxisTag	OPTIONAL STRING	STRING
AxisCurve	IfcBoundedCurve	No Change
SameSenseAsBaseCurve	BOOLEAN	New attribute in R2.0 Final
AlignedGridIntersections	SET [0:?] OF IfcGridIntersection	No Change
SameSense	BOOLEAN	Deleted

2.2.75. Class IfcGridLevel

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
PartOfDesignGrid	IfcDesignGrid	No Change
GridLevelHeight	OPTIONAL IfcLengthMeasure	IfcLengthMeasure
GridLevelName	OPTIONAL STRING	STRING

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
HasGridAxes	SET [1:?] OF IfcGridAxis	No Change

2.2.76. Type IfcWorkTaskStatusEnum

Name

Name changed from IfcTaskStatusEnum to IfcWorkTaskStatusEnum in R2.0 Final

Enumeration

R2.0 Final	Change from Release 1.5.1
Completed	No Change
Started	No Change
NotYetStarted	No Change
UserDefined	New in R2.0 Final
NotDefined	New in R2.0 Final

2.2.77. Class IfcRelNestsProcesses

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Criteria	OPTIONAL STRING	New attribute in R2.0 Final
NestingPurpose	STRING	Deleted
NestingCriteria	STRING	Deleted

2.2.78. Class IfcRelUsesResource

Schema

Moved from IfcKernel to IfcProcessExtension in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
RelatingProcess	IfcProcess	No Change
RelatedResource	IfcResource	No Change
Duration	OPTIONAL IfcTimeMeasure	New attribute in R2.0 Final
Quantity	OPTIONAL IfcMeasureWithUnit	New attribute in R2.0 Final
ProductivityConversionRate	OPTIONAL IfcMeasureWithUnit	New attribute in R2.0 Final
ConverterMultiplierOrDivider	OPTIONAL IfcMultiplierOrDivider	New attribute in R2.0 Final
ResourceUseCosts	SET [0:?] OF IfcCostElement	New attribute in R2.0 Final
WasteFactor	OPTIONAL REAL	New attribute in R2.0 Final
ResourceDuration	IfcTimeDurationMeasure	Deleted
ResourceQuantity	REAL	Deleted
ResourceUseCost	IfcCost	Deleted

2.2.79. Class IfcWorkSchedule

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
WorkScheduleID	STRING	New attribute in R2.0 Final
WorkScheduleName	STRING	New attribute in R2.0 Final
Description	OPTIONAL STRING	New attribute in R2.0 Final
WorkSchedulePurpose	OPTIONAL STRING	New attribute in R2.0 Final

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
CreationDate	IfcDateTimeSelect	New attribute in R2.0 Final
Schedulers	SET [0:?] OF IfcActorSelect	New attribute in R2.0 Final
ScheduleElements	SET [1:?] OF IfcWorkScheduleElement	New attribute in R2.0 Final
TotalElements	INTEGER	New attribute in R2.0 Final
Resources	SET [0:?] OF IfcResource	New attribute in R2.0 Final
BaseSchedule	OPTIONAL IfcWorkSchedule	New attribute in R2.0 Final
StartTime	IfcDateTimeSelect	New attribute in R2.0 Final
FinishTime	OPTIONAL IfcDateTimeSelect	New attribute in R2.0 Final
Duration	OPTIONAL IfcTimeMeasure	New attribute in R2.0 Final
TotalFloat	OPTIONAL IfcTimeMeasure	OPTIONAL IfcTimeDurationMeasure
WorkPlan	IfcWorkPlan	New attribute in R2.0 Final
ActualStart	IfcDateTimeSelect	Deleted
EarliestStart	IfcDateTimeSelect	Deleted
LatestStart	IfcDateTimeSelect	Deleted
ActualFinish	IfcDateTimeSelect	Deleted
EarliestFinish	IfcDateTimeSelect	Deleted
LatestFinish	IfcDateTimeSelect	Deleted
StatusTime	IfcDateTimeSelect	Deleted
ScheduledStart	IfcDateTimeSelect	Deleted
ScheduledFinish	IfcDateTimeSelect	Deleted
ScheduledDuration	IfcTimeDurationMeasure	Deleted
RemainingTime	IfcTimeDurationMeasure	Deleted
FreeFloat	IfcTimeDurationMeasure	Deleted
TaskStatus	IfcTaskStatusEnum	Deleted
IsCritical	BOOLEAN	Deleted

2.2.80. Class IfcWorkTask

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
WorkTaskID	STRING	New attribute in R2.0 Final
WorkTaskName	STRING	New attribute in R2.0 Final
WBSCode	LIST [0:?] OF STRING	New attribute in R2.0 Final
WBSSource	LIST [0:?] OF STRING	New attribute in R2.0 Final
Status	IfcWorkTaskStatusEnum	New attribute in R2.0 Final
Milestones	SET [0:?] OF IfcWorkTaskMilestoneEnum	New attribute in R2.0 Final
WorkMethod	OPTIONAL STRING	No Change
InPlaceQuantity	OPTIONAL IfcMeasureWithUnit	New attribute in R2.0 Final
EstimatedQuantity	OPTIONAL IfcMeasureWithUnit	New attribute in R2.0 Final
BudgetQuantity	OPTIONAL IfcMeasureWithUnit	New attribute in R2.0 Final
ScheduleElements	SET [0:?] OF IfcWorkScheduleElement	New attribute in R2.0 Final
WorkPlans	SET [0:?] OF IfcWorkPlan	New attribute in R2.0 Final
WorkTaskId	STRING	Deleted
TaskDescription	STRING	Deleted
TaskCost	IfcCost	Deleted
WorkTaskSchedulingData	IfcWorkSchedule	Deleted

2.2.81. Type IfcConnectionEnum

Name

Name changed from IfcConnectionTypeEnum to IfcConnectionEnum in R2.0 Final

Enumeration

R2.0 Final	Change from Release 1.5.1
AtPath	No Change
Start	No Change
AtEnd	No Change
NotDefined	New in R2.0 Final
NotKnown	Deleted

2.2.82. Class IfcBuilding

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
BuildingReference	OPTIONAL STRING	New attribute in R2.0 Final
BuildingName	OPTIONAL STRING	New attribute in R2.0 Final
calcTotalHeight	OPTIONAL IfcLengthMeasure	No Change
calcSiteCoverage	OPTIONAL IfcAreaMeasure	No Change
calcTotalVolume	OPTIONAL IfcVolumeMeasure	No Change
ElevationOfRefHeight	OPTIONAL IfcLengthMeasure	New attribute in R2.0 Final
ElevationOfTerrain	OPTIONAL IfcLengthMeasure	New attribute in R2.0 Final
ServicedBySystems	SET [0:?] OF IfcRelServicesBuildings	No Change
GenericType	IfcBuildingTypeEnum	Deleted

2.2.83. Class IfcBuildingStorey

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
BuildingStoreyReference	OPTIONAL STRING	New attribute in R2.0 Final
BuildingStoreyName	OPTIONAL STRING	New attribute in R2.0 Final
Elevation	IfcLengthMeasure	No Change
calcTotalHeight	OPTIONAL IfcLengthMeasure	No Change
calcTotalArea	OPTIONAL IfcAreaMeasure	No Change
calcTotalVolume	OPTIONAL IfcVolumeMeasure	No Change
GenericType	IfcBuildingStoreyTypeEnum	Deleted

2.2.84. Class IfcOpeningElement

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
calcOpeningArea	OPTIONAL IfcAreaMeasure	No Change
VoidsElements	IfcRelVoidsElement	SET [0:1] OF IfcRelVoidsElement
HasFillings	SET [0:?] OF IfcRelFillsElement	No Change
GenericType	IfcOpeningTypeEnum	Deleted

2.2.85. Class IfcRelConnectsPathElements

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
RelatingPriorities	LIST [0:RelatingLayerCount] OF INTEGER	No Change
RelatedPriorities	LIST [0:RelatedLayerCount] OF INTEGER	No Change
RelatingConnectionType	IfcConnectionEnum	IfcConnectionTypeEnum
RelatedConnectionType	IfcConnectionEnum	IfcConnectionTypeEnum
RelatingLayerCount	INTEGER	No Change
RelatedLayerCount	INTEGER	No Change

2.2.86. Class IfcSite

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
RefLatitude	OPTIONAL IfcCompoundPlaneAngleMeasure	IfcCompoundPlaneAngleMeasure
RefLongitude	OPTIONAL IfcCompoundPlaneAngleMeasure	IfcCompoundPlaneAngleMeasure
RefElevation	OPTIONAL IfcLengthMeasure	IfcLengthMeasure
TrueNorth	OPTIONAL IfcDirection	New attribute in R2.0 Final
calcSitePerimeter	OPTIONAL IfcPositiveLengthMeasure	No Change
calcSiteArea	OPTIONAL IfcAreaMeasure	No Change
GenericType	IfcSiteTypeEnum	Deleted

2.2.87. Class IfcSpace

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
BoundedBy	LIST [1:?] OF IfcSpaceBoundary	No Change
InteriorOrExteriorSpace	IfcInternalOrExternalEnum	New attribute in R2.0 Final
SpaceReference	OPTIONAL STRING	New attribute in R2.0 Final
SpaceName	OPTIONAL STRING	New attribute in R2.0 Final
calcTotalPerimeter	OPTIONAL IfcPositiveLengthMeasure	No Change
calcTotalArea	OPTIONAL IfcAreaMeasure	No Change
calcTotalVolume	OPTIONAL IfcVolumeMeasure	No Change
calcAverageHeight	OPTIONAL IfcPositiveLengthMeasure	No Change
calcAverageGrossHeight	OPTIONAL IfcPositiveLengthMeasure	New attribute in R2.0 Final
calcAverageClearHeight	OPTIONAL IfcPositiveLengthMeasure	New attribute in R2.0 Final
calcElevationWithFlooring	OPTIONAL IfcLengthMeasure	New attribute in R2.0 Final
IsAssemblyThrough	SET [0:1] OF IfcRelAssemblesSpaces	No Change
PartOfAssembly	SET [0:1] OF IfcRelAssemblesSpaces	No Change
GenericType	IfcSpaceTypeEnum	Deleted

2.2.88. Class IfcSpaceBoundary

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
PhysicalOrVirtualBoundary	IfcPhysicalOrVirtualEnum	New attribute in R2.0 Final
InternalOrExternalBoundary	IfcInternalOrExternalEnum	New attribute in R2.0 Final
calcBoundarySurfaceArea	OPTIONAL IfcAreaMeasure	No Change
Bounds	SET [1:2] OF IfcSpace	No Change

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
ProvidedBy	SET [0:1] OF IfcRelSeparatesSpaces	No Change
PhysicalOrVirtual	BOOLEAN	Deleted

2.2.89. Class IfcSystem

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
ServicesBuildings	SET [0:1] OF IfcRelServicesBuildings	No Change
GenericType	IfcSystemTypeEnum	Deleted

2.2.90. Class IfcZone

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
GenericType	IfcZoneTypeEnum	Deleted

2.2.91. Class IfcCostElement

Schema

Moved from to IfcProjectMgmtExtension in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Description	OPTIONAL STRING	New attribute in R2.0 Final
ContextDescription	STRING	OPTIONAL STRING
ElementCost	OPTIONAL IfcCost	No Change
ExtensionCost	OPTIONAL IfcCost	No Change
CostUse	IfcCostUseEnum	New attribute in R2.0 Final
PreparedOn	OPTIONAL IfcDateTimeSelect	No Change
Quantity	OPTIONAL IfcMeasureWithUnit	OPTIONAL NUMBER
CostSchedule	IfcCostSchedule	New attribute in R2.0 Final
PartOfCostSchedule	SET [0:1] OF IfcCostSchedule	Deleted
CostsProducts	SET [0:1] OF IfcRelCostsProducts	Deleted

2.2.92. Class IfcCostSchedule

Schema

Moved from to IfcProjectMgmtExtension in R2.0 Final

Superclass

Superclass changed from IfcDocument to IfcControl

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Title	STRING	New attribute in R2.0 Final
SubmittedBy	OPTIONAL IfcActorSelect	No Change
ApprovedBy	SET [0:?] OF IfcActorSelect	OPTIONAL IfcPerson
PreparedBy	IfcActorSelect	OPTIONAL IfcPerson
SubmittedOn	OPTIONAL IfcDateTimeSelect	No Change
TotalCost	IfcCost	New attribute in R2.0 Final

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
CostElements	LIST [0:?] OF IfcCostElement	New attribute in R2.0 Final
ScheduleTitle	STRING	Deleted
Cost	IfcCost	Deleted
HasCostElements	LIST [1:?] OF IfcCostElement	Deleted

2.2.93. Class IfcRelNestsCostElements

Schema

Moved from to IfcProjectMgmtExtension in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
Description	OPTIONAL STRING	New attribute in R2.0 Final
Criteria	OPTIONAL STRING	New attribute in R2.0 Final
NestingDescription	STRING	Deleted
NestingCriteria	STRING	Deleted

2.2.94. Type IfcCoveringTypeEnum

Enumeration

R2.0 Final	Change from Release 1.5.1
Ceiling	No Change
Flooring	No Change
Cladding	New in R2.0 Final
CoveringMillwork	New in R2.0 Final
UserDefined	New in R2.0 Final
NotDefined	New in R2.0 Final
WallCovering	Deleted

2.2.95. Type IfcSlabTypeEnum

Name

Name changed from IfcRoofSlabTypeEnum to IfcSlabTypeEnum in R2.0 Final

Enumeration

R2.0 Final	Change from Release 1.5.1
Floor	New in R2.0 Final
Roof	New in R2.0 Final
UserDefined	New in R2.0 Final
NotDefined	New in R2.0 Final
SolidSlab	Deleted
LayeredSlab	Deleted
ElementedSlab	Deleted

2.2.96. Class IfcBeam

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
calcBeamSectionArea	OPTIONAL IfcAreaMeasure	No Change

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
calcBeamVolume	OPTIONAL IfcVolumeMeasure	No Change
GenericType	IfcBeamTypeEnum	Deleted

2.2.97. Class IfcBuiltIn

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
GenericType	IfcBuiltInTypeEnum	Deleted

2.2.98. Class IfcColumn

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
calcColumnSectionArea	OPTIONAL IfcAreaMeasure	No Change
calcColumnVolume	OPTIONAL IfcVolumeMeasure	No Change
GenericType	IfcColumnTypeEnum	Deleted

2.2.99. Class IfcCovering

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
PredefinedType	IfcCoveringTypeEnum	New attribute in R2.0 Final
LayerInformation	IfcMaterialLayerSetUsage	No Change
calcCoveringArea	OPTIONAL IfcAreaMeasure	No Change
HasMaterial	IfcMaterialSelect	No Change
Covers	IfcRelCoversBldgElements	No Change
AttachedTo	SET [0:?] OF IfcRelAttachesToBoundaries	New attribute in R2.0 Final
GenericType	IfcCoveringTypeEnum	Deleted

2.2.100. Class IfcDoor

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
GenericType	IfcDoorTypeEnum	Deleted

2.2.101. Class IfcSlab

Name

Name changed from IfcRoofSlab to IfcSlab in R2.0 Final

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
PredefinedType	IfcSlabTypeEnum	New attribute in R2.0 Final
LayerInformation	IfcMaterialLayerSetUsage	No Change
calcSlabArea	OPTIONAL IfcAreaMeasure	New attribute in R2.0 Final
calcSlabVolume	OPTIONAL IfcVolumeMeasure	New attribute in R2.0 Final
HasMaterial	IfcMaterialSelect	No Change
GenericType	IfcRoofSlabTypeEnum	Deleted
calcRoofSlabArea	IfcAreaMeasure	Deleted

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
calcRoofSlabVolume	IfcVolumeMeasure	Deleted

2.2.102. Class IfcWall

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
LayerInformation	IfcMaterialLayerSetUsage	No Change
calcWallArea	OPTIONAL IfcAreaMeasure	No Change
calcWallVolume	OPTIONAL IfcVolumeMeasure	No Change
HasMaterial	IfcMaterialSelect	No Change
GenericType	IfcWallTypeEnum	Deleted

2.2.103. Class IfcWindow

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
GenericType	IfcWindowTypeEnum	Deleted

2.2.104. Type IfcDiscreteElementTypeEnum

Enumeration

R2.0 Final	Change from Release 1.5.1
Insulation	No Change
UserDefined	New in R2.0 Final
NotDefined	New in R2.0 Final

2.2.105. Type IfcElectricalApplianceTypeEnum

Enumeration

R2.0 Final	Change from Release 1.5.1
Computer	No Change
Copier	No Change
Facsimile	No Change
Printer	No Change
Telephone	No Change
UserDefined	New in R2.0 Final
NotDefined	New in R2.0 Final

2.2.106. Type IfcEquipmentTypeEnum

Enumeration

R2.0 Final	Change from Release 1.5.1
WindowCleaning	New in R2.0 Final
UserDefined	New in R2.0 Final
NotDefined	New in R2.0 Final
AirFilter	Deleted
AirHandler	Deleted
Boiler	Deleted
Chiller	Deleted

R2.0 Final	Change from Release 1.5.1
Coil	Deleted
Compressor	Deleted
Convector	Deleted
CoolingTower	Deleted
Fan	Deleted
HeatExchanger	Deleted
Motor	Deleted
PackagedACUnit	Deleted
Pump	Deleted
TubeBundle	Deleted
UnitHeater	Deleted

2.2.107. Class IfcDiscreteElement

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
PredefinedType	IfcDiscreteElementTypeEnum	New attribute in R2.0 Final
Attaches	IfcRelAttachesElements	New attribute in R2.0 Final
GenericType	IfcDiscreteElementTypeEnum	Deleted

2.2.108. Class IfcDistributionElement

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
AttachedBy	SET [0:?] OF IfcRelAttachesElements	New attribute in R2.0 Final
GenericType	IfcDistributionElementTypeEnum	Deleted

2.2.109. Class IfcElectricalAppliance

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
PredefinedType	IfcElectricalApplianceTypeEnum	New attribute in R2.0 Final
GenericType	IfcElectricalApplianceTypeEnum	Deleted

2.2.110. Class IfcEquipment

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
PredefinedType	IfcEquipmentTypeEnum	New attribute in R2.0 Final
GenericType	IfcEquipmentTypeEnum	Deleted

2.2.111. Type IfcSpaceProgramTypeEnum

Enumeration

R2.0 Final	Change from Release 1.5.1
CirculationSpaceProgram	New in R2.0 Final
OccupiedSpaceProgram	New in R2.0 Final
OccupiedSpaceProgramStandard	New in R2.0 Final
TechnicalSpaceProgram	New in R2.0 Final

R2.0 Final	Change from Release 1.5.1
UserDefined	New in R2.0 Final
NotDefined	New in R2.0 Final
SpaceStandard	Deleted
SpaceUnique	Deleted

2.2.112. Class IfcRelAdjacencyReq

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
RelatingSpaceProgram	IfcSpaceProgram	No Change
RelatedSpaceProgram	IfcSpaceProgram	No Change
AdjacencyImportanceRating	INTEGER	New attribute in R2.0 Final
RequiredAdjacency	INTEGER	Deleted

2.2.113. Class IfcSpaceProgram

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
SpaceProgramName	OPTIONAL STRING	New attribute in R2.0 Final
PredefinedType	IfcSpaceProgramTypeEnum	New attribute in R2.0 Final
HasAdjacencyReqsTo	SET [0:?] OF IfcRelAdjacencyReq	No Change
HasAdjacencyReqFrom	SET [0:?] OF IfcRelAdjacencyReq	No Change
SpaceName	STRING	Deleted
GenericType	IfcSpaceProgramTypeEnum	Deleted
ProgramForSpaces	SET [1:?] OF IfcSpace	Deleted

2.2.114. Class IfcSpaceProgramGroup

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
RequiredGroupArea	OPTIONAL IfcAreaMeasure	No Change
GroupRole	OPTIONAL STRING	STRING
GroupAssignment	OPTIONAL IfcActorSelect	IfcActorSelect

2.2.115. Type IfcFurnitureTypeEnum

Enumeration

R2.0 Final	Change from Release 1.5.1
Table	No Change
Chair	No Change
Desk	No Change
FileCabinet	No Change
UserDefined	New in R2.0 Final
NotDefined	New in R2.0 Final

2.2.116. Class IfcFurniture

Attributes and Relationships

Attribute / Relation	R2.0 Final	Change from Release 1.5.1
PredefinedType	IfcFurnitureTypeEnum	New attribute in R2.0 Final
AssignedTo	SET [0:?] OF IfcActorSelect	OPTIONAL IfcActorSelect
FurnitureModel	IfcFurnitureModel	New attribute in R2.0 Final
GenericType	IfcFurnitureTypeEnum	Deleted

3. Guidelines for Implementing Property Sets

Status: Draft

This guide applies to the R2.0 Spreadsheet format. The format specified in this document will also be used in the printable- and online documentation of the PropertySets. The purpose of the encoding is to tell the implementers how the pre defined Psets should be implemented and by doing that ensure a consistent implementation of PropertySets.

3.1. The spreadsheet

A	B	C	D	E	F	G
4	IFC Release 2.0 PreFinal					
5	Interoperability Layer					
6	IfcSharedBldgElements					
7						
8						
9	PropertySet (Pset) Name					
10	Property name	Property Type	Data Type/Related Object		Min	Max
27	Pset_BuiltInCounterTop					
28	CounterTopMaterial	IfcObjectReference	IfcMaterial	see type	Si	Si
29	CounterSubstrateMaterial	IfcObjectReference	IfcMaterial	see type	Si	Si
30	Pset_BuiltInRailing					
31	RailHeight	IfcSimpleProperty	IfcPositiveLengthMeasure	0	Si	Si
32	RailWidth	IfcSimpleProperty	IfcPositiveLengthMeasure	0	Si	Si
33	RailDepth	IfcSimpleProperty	IfcPositiveLengthMeasure	0	Si	Si

The Property Type is defined in Column E 'Property Type' and the Data Type in column F 'Data Type / Related Object'.

3.2. Property Types

There are several different cases how properties can be used in the IFC model. The following list gives an quick overview of the different possibilities . Each case is then elaborated in more detail in the 'Encoding Property Types and Data Types' section.

1	IfcSimpleProperty	The most common case, which includes the name of the property and a value.
2	IfcSimplePropertyWithUnit	Includes the name of the property, value and unit
3	IfcEnumeratedProperty	Limits the value of the property to a pre defined list of values
4	IfcObjectReference	IfcObjectReference has 3 possible use case 1. Reference to an object which is included in IfcObjectReferenceSelect 2. Reference to an object which is not included in IfcObjectReferenceSelect 3. Reference from a PropertySet to another PropertySet.
5	IfcLibraryReference	Reference to a external library
6	IfcPropertyList	The first 5 property types are single properties and the sixth type (IfcPropertyList) is used to make a list of properties using any of the

		other 5 types. NOTE: An instance of IfcPropertyList can contain a mix of the other 5 property types, but this possibility is currently not used in the pre defined PropertySets
--	--	--

3.3. Data Type / Related Type

The Data Type / Related Type column is different from the corresponding column in other worksheets. For PropertySets this column does not contain information needed to produce EXPRESS code, but information needed to implement the PropertySets in an consistent way.

3.4. Encoding Property Types and Data Types

3.4.1. A single Simple Property

EXPRESS:

IfcReal

Documentation:

Pset_Example

Property Name	Property Type	Data Type / Relation
ExampleProperty	IfcSimpleProperty	IfcReal

Instantiation:

Object	Attributes	Data
<i>IfcPropertySet (#1)</i>	GlobalId	Defined by app. at runtime
	OwnerHistory	Defined by app. at runtime
	<i>Label</i>	Defined by app. at runtime
	Name	Pset_Example
	HasProperties	#2
	NestedByPropertySets	Defined by app. at runtime
<i>IfcSimpleProperty (#2)</i>	Name	ExampleProperty
	ValueComponent	<An IfcReal value>

3.4.2. A list of Simple Properties

EXPRESS:

LIST [1:?] OF IfcReal

Documentation:

Pset_Example

Property Name	Property Type	Data Type / Relation
ExampleProperty	IfcPropertyList [1:?]	IfcSimpleProperty, IfcReal

Instantiation:

Object	Attributes	Data
IfcPropertySet (#1)	GlobalId	Defined by app. at runtime
	OwnerHistory	Defined by app. at runtime
	Label	Defined by app. at runtime
	Name	Pset_Example
	HasProperties	#2
	NestedByPropertySets	Defined by app. at runtime
IfcPropertyList (#2)	Name	ExampleProperty
	HasPropertyList	#3
		#4
	UserMin	1
	Max	?
IfcSimpleProperty (#3)	Name	Defined by app. at runtime
	ValueComponent	<An IfcReal value>
IfcSimpleProperty (#4)	Name	Defined by app. at runtime
	ValueComponent	<An IfcReal value>

3.4.3. A single Property with Unit

EXPRESS:

No direct mapping to EXPRESS possible

Documentation:

Pset_Example

Property Name	Property Type	Data Type / Relation
ExampleProperty	IfcSimplePropertyWithUnit	IfcReal, ThermalTransmittanceUnit

Instantiation:

Object	Attributes	Data
<i>IfcPropertySet (#1)</i>	GlobalId	Defined by app. at runtime
	OwnerHistory	Defined by app. at runtime
	<i>Label</i>	Defined by app. at runtime
	Name	Pset_Example
	HasProperties	#2
	NestedByPropertySets	Not relevant for this example
<i>IfcSimplePropertyWithUnit (#2)</i>	Name	ExampleProperty
	ValueWithUnit	#3
<i>IfcMeasureWithUnit (#3)</i>	ValueComponent	<An IfcReal value>
	UnitComponent	ThermalTransmittanceUnit

3.4.4. A list of Properties with Unit**EXPRESS:**

No direct mapping to EXPRESS possible

Documentation:

Pset_Example

Property Name	Property Type	Data Type / Relation
ExampleProperty	IfcPropertyList [1:?]	IfcSimplePropertyWithUnit, IfcReal, ThermalTransmittanceUnit

Instantiation:

Object	Attributes	Data
<i>IfcPropertySet (#1)</i>	GlobalId	Defined by app. at runtime
	OwnerHistory	Defined by app. at runtime
	<i>Label</i>	Defined by app. at runtime
	Name	Pset_Example
	HasProperties	#2
	NestedByPropertySets	Defined by app. at runtime
<i>IfcPropertyList (#2)</i>	Name	ExampleProperty
	HasPropertyList	#3
		#4
	UserMin	1
	Max	?

IfcSimplePropertyWithUnit (#3)	Name	Defined by app. at runtime
	ValueWithUnit	#5
IfcSimplePropertyWithUnit (#4)	Name	Defined by app. at runtime
	ValueWithUnit	#6
IfcMeasureWithUnit (#5)	ValueComponent	<i><An IfcReal value></i>
	UnitComponent	ThermalTransmittanceUnit
IfcMeasureWithUnit (#6)	ValueComponent	<i><An IfcReal value></i>
	UnitComponent	ThermalTransmittanceUnit

3.4.5. A single Enumerated Property

EXPRESS:

No direct mapping to EXPRESS possible

Documentation:

Pset_Example

Property Name	Property Type	Data Type / Relation
ExampleProperty	IfcEnumeratedProperty	Pset_ExampleEnum(Chose1, Chose2)

Instantiation:

Object	Attributes	Data
IfcPropertySet (#1)	GlobalId	Defined by app. at runtime
	OwnerHistory	Defined by app. at runtime
	Label	Defined by app. at runtime
	Name	Pset_Example
	HasProperties	#2
	NestedByPropertySets	Defined by app. at runtime
IfcEnumeratedProperty (#2)	Name	ExampleProperty
	EnumerationIndex	Defined by app. at runtime
	Enumeration	#3
IfcEnumeration (#3)	Name	Pset_ExampleEnum
	Items	Chose1
		Chose2

3.4.6. A list of Enumerated Properties

EXPRESS:

No direct mapping to EXPRESS possible

Documentation:

Pset_Example

Property Name	Property Type	Data Type / Relation
ExampleProperty	IfcPropertyList [1:?]	IfcEnumeratedProperty, Pset_ExampleEnum(Choise1, Choise2)

Instantiation:

Object	Attributes	Data
<i>IfcPropertySet (#1)</i>	GlobalId	Defined by app. at runtime
	OwnerHistory	Defined by app. at runtime
	<i>Label</i>	Defined by app. at runtime
	Name	Pset_Example
	HasProperties	#2
	NestedByPropertySets	Defined by app. at runtime
<i>IfcPropertyList (#2)</i>	Name	ExampleProperty
	HasPropertyList	#3 #4
	UserMin	1
	Max	?
<i>IfcEnumeratedProperty (#3)</i>	Name	Defined by app. at runtime
	EnumerationIndex	Defined by app. at runtime
	Enumeration	#5
<i>IfcEnumeratedProperty (#4)</i>	Name	Defined by app. at runtime
	EnumerationIndex	Defined by app. at runtime
	Enumeration	#5
<i>IfcEnumeration (#5)</i>	Name	Pset_ExampleEnum
	Items	Choise1 Choise2

3.4.7. A single Object Reference to an object in IfcObjectReferenceSelect

NOTE:

The objects included in IfcObjectReferenceSelect are:

- IfcPerson

- IfcOrganization
- IfcPersonAndOrganization
- IfcClassification
- IfcCost
- IfcCalendarDate
- IfcLocalTime
- IfcDateAndTime
- IfcDocumentReference
- IfcMaterial
- IfcMaterialLayer
- IfcMaterialLayerSet
- IfcMaterialList
- IfcMaterialFinish

EXPRESS:

IfcMaterial

Documentation:

Pset_Example

Property Name	Property Type	Data Type / Relation
ExampleProperty	IfcObjectReference	IfcMaterial

Instantiation:

Object	Attributes	Data
IfcPropertySet (#1)	GlobalId	Defined by app. at runtime
	OwnerHistory	Defined by app. at runtime
	Label	Defined by app. at runtime
	Name	Pset_Example
	HasProperties	#2
	NestedByPropertySets	Defined by app. at runtime
IfcObjectReference (#2)	Name	ExampleProperty
	ObjectReference	#3
IfcMaterial (#3)	OPT MaterialClassification	Defined by app. at runtime
	OPT Finishes	Defined by app. at runtime
	OPT Properties	Defined by app. at runtime

3.4.8. A list of Object References to objects in IfcObjectReferenceSelect

NOTE:

The objects included in IfcObjectReferenceSelect are:

- IfcPerson
- IfcOrganization

- IfcPersonAndOrganization
- IfcClassification
- IfcCost
- IfcCalendarDate
- IfcLocalTime
- IfcDateAndTime
- IfcDocumentReference
- IfcMaterial
- IfcMaterialLayer
- IfcMaterialLayerSet
- IfcMaterialList
- IfcMaterialFinish

EXPRESS:***LIST [1:?] OF IfcMaterial******Documentation:***

Pset_Example

Property Name	Property Type	Data Type / Relation
ExampleProperty	IfcPropertyList [1:?]	IfcObjectReference, IfcMaterial

Instantiation:

Object	Attributes	Data
IfcPropertySet (#1)	GlobalId	Defined by app. at runtime
	OwnerHistory	Defined by app. at runtime
	Label	Defined by app. at runtime
	Name	Pset_Example
	HasProperties	#2
	NestedByPropertySets	Defined by app. at runtime
IfcPropertyList (#2)	Name	ExampleProperty
	HasPropertyList	#3 #4
	UserMin	1
	Max	?
IfcObjectReference (#3)	Name	Defined by app. at runtime
	ObjectReference	#5
IfcObjectReference (#4)	Name	Defined by app. at runtime
	ObjectReference	#6
IfcMaterial (#5)	OPT MaterialClassification	Defined by app. at runtime
	OPT Finishes	Defined by app. at runtime
	OPT Properties	Defined by app. at runtime

IfcMaterial (#6)	OPT	MaterialClassification	Defined by app. at runtime
	OPT	Finishes	Defined by app. at runtime
	OPT	Properties	Defined by app. at runtime

3.4.9. A single Object Reference to an object NOT included in IfcObjectReferenceSelect

NOTE:

Objects which are not included in IfcObjectReferenceSelect are referenced through their Globally Unique ID (GUID). Objects which are not included in IfcObjectReferenceSelect and which do NOT have an GUID can not be referenced from PropertySets.

EXPRESS:

IfcSpace

Documentation:

Pset_Example

Property Name	Property Type	Data Type / Relation
ExampleProperty	IfcObjectReference	IfcGloballyUniqueId, IfcSpace

Instantiation:

Object	Attributes	Data
IfcPropertySet (#1)	GlobalId	Defined by app. at runtime
	OwnerHistory	Defined by app. at runtime
	Label	Defined by app. at runtime
	Name	Pset_Example
	HasProperties	#2
	NestedByPropertySets	Defined by app. at runtime
IfcObjectReference (#2)	Name	ExampleProperty
	ObjectReference	<GUID of an IfcSpace>

3.4.10. A list of Object References to objects NOT included in IfcObjectReferenceSelect

NOTE:

Objects which are not included in IfcObjectReferenceSelect are referenced through their Globally Unique ID (GUID). Objects which are not included in

IfcObjectReferenceSelect and which do NOT have an GUID can not be referenced from PropertySets.

EXPRESS:

LIST [1:?] OF IfcSpace

Documentation:

Pset_Example

Property Name	Property Type	Data Type / Relation
ExampleProperty	IfcPropertyList [1:?]	IfcObjectReference, IfcGloballyUniqueId, IfcSpace

Instantiation:

Object	Attributes	Data
IfcPropertySet (#1)	GlobalId	Defined by app. at runtime
	OwnerHistory	Defined by app. at runtime
	Label	Defined by app. at runtime
	Name	Pset_Example
	HasProperties	#2
	NestedByPropertySets	Defined by app. at runtime
IfcPropertyList (#2)	Name	ExampleProperty
	HasPropertyList	#3
		#4
	UserMin	1
	Max	?
IfcObjectReference (#3)	Name	Defined by app. at runtime
	ObjectReference	<GUID of an IfcSpace>
IfcObjectReference (#4)	Name	Defined by app. at runtime
	ObjectReference	<GUID of an IfcSpace>

3.4.11. A single Object Reference to a PropertySet

NOTE:

PropertySets are referenced through the Globally Unique ID (GUID) of the referenced PropertySet.

EXPRESS:

No direct mapping to EXPRESS possible

Documentation:

Pset_Example

Property Name	Property Type	Data Type / Relation
ExampleProperty	IfcObjectReference	IfcGloballyUniqueId, Pset_Example2

Instantiation:

Object	Attributes	Data
<i>IfcPropertySet (#1)</i>	GlobalId	Defined by app. At runtime
	OwnerHistory	Defined by app. At runtime
	<i>Label</i>	Defined by app. At runtime
	Name	Pset_Example
	HasProperties	#2
	NestedByPropertySets	Defined by app. at runtime
<i>IfcObjectReference (#2)</i>	Name	ExampleProperty
	ObjectReference	<GUID of an Pset_Example2>

3.4.12. A list of Object References to PropertySets

NOTE:

PropertySets are referenced through the Globally Unique ID (GUID) of the referenced PropertySet.

EXPRESS:

No direct mapping to EXPRESS possible

Documentation:

Pset_Example

Property Name	Property Type	Data Type / Relation
ExampleProperty	IfcPropertyList [1:?]	IfcObjectReference, IfcGloballyUniqueId, Pset_Example2

Instantiation:

Object	Attributes	Data
<i>IfcPropertySet (#1)</i>	GlobalId	Defined by app. at runtime
	OwnerHistory	Defined by app. at runtime
	<i>Label</i>	Defined by app. at runtime
	Name	Pset_Example
	HasProperties	#2
	NestedByPropertySets	Defined by app. at runtime
<i>IfcPropertyList (#2)</i>	Name	ExampleProperty
	HasPropertyList	#3
		#4
	UserMin	1
	Max	?
<i>IfcObjectReference (#3)</i>	Name	Defined by app. at runtime
	ObjectReference	<GUID of an Pset_Example2>
<i>IfcObjectReference (#4)</i>	Name	Defined by app. at runtime
	ObjectReference	<GUID of an Pset_Example2>

3.4.13. A single Library Reference**EXPRESS:**

No direct mapping to EXPRESS possible

Documentation:

Pset_Example

Property Name	Property Type	Data Type / Relation
ExampleProperty	IfcLibraryReference	IfcLibraryReference

Instantiation:

Object	Attributes	Data
<i>IfcPropertySet (#1)</i>	GlobalId	Defined by app. at runtime
	OwnerHistory	Defined by app. at runtime
	<i>Label</i>	Defined by app. at runtime
	Name	Pset_Example
	HasProperties	#2
	NestedByPropertySets	Defined by app. at runtime
<i>IfcLibraryReference (#2)</i>	Name	ExampleProperty
	LibraryURL	Defined by app. at runtime
	LibraryName	Defined by app. at runtime
	LibrarySectionReference	Defined by app. at runtime

3.4.14. A list of Library References

EXPRESS:

No direct mapping to EXPRESS possible

Documentation:

Pset_Example

Property Name	Property Type	Data Type / Relation
ExampleProperty	IfcPropertyList	IfcLibraryReference

Instantiation:

Object	Attributes	Data
IfcPropertySet (#1)	GlobalId	Defined by app. at runtime
	OwnerHistory	Defined by app. at runtime
	Label	Defined by app. at runtime
	Name	Pset_Example
	HasProperties	#2
	NestedByPropertySets	Defined by app. at runtime
IfcPropertyList (#2)	Name	ExampleProperty
	HasPropertyList	#3
		#4
	UserMin	1
	Max	?
IfcLibraryReference (#3)	Name	Defined by app. at runtime
	LibraryURL	Defined by app. at runtime
	LibraryName	Defined by app. at runtime
	LibrarySectionReference	Defined by app. at runtime
IfcLibraryReference (#4)	Name	Defined by app. at runtime
	LibraryURL	Defined by app. at runtime
	LibraryName	Defined by app. at runtime
	LibrarySectionReference	Defined by app. at runtime